



Polymet - Leakage conditions for mound at year 2070**Units below
are ft-day**

$KK_1 := 0.31 \cdot \frac{\text{ft}}{\text{day}}$	Hydraulic Conductivity Upper Virginia Fm.	$K_1 := KK_1 \cdot \text{ft}^{-1} \cdot \text{day}$	$K_1 = 0.310$
$KK_2 := 0.9 \cdot \frac{\text{ft}}{\text{day}}$	Hydraulic Conductivity Biwabik Fm.	$K_2 := KK_2 \cdot \text{ft}^{-1} \cdot \text{day}$	$K_2 = 0.900$
$WW := 7.93 \cdot \frac{\text{in}}{\text{yr}}$	Downward leakage flux into bedrock	$\underline{W} := WW \cdot \text{ft}^{-1} \cdot \text{day}$	$W = 1.81 \times 10^{-3}$
$LL := 7690 \cdot \text{ft}$	Length of flow system (East Pit to PMP)	$\underline{L} := LL \cdot \text{ft}^{-1}$	$L = 7690.0$
$DD := 4490 \cdot \text{ft}$	Distance to Virginia/Biwabik contact	$D := DD \cdot \text{ft}^{-1}$	$D = 4490.0$
$ww := 4500 \cdot \text{ft}$	Flow tube width	$w := ww \cdot \text{ft}^{-1}$	$w = 4500.0$
$GG_o := 1620 \cdot \text{ft}$	Ground elevation at x=0	$G_o := GG_o \cdot \text{ft}^{-1}$	$G_o = 1620.0$
$HH_o := 1592 \cdot \text{ft}$	Head at x=0	$H_o := HH_o \cdot \text{ft}^{-1}$	$H_o = 1592.0$
$BB_o := 1220 \cdot \text{ft}$	Base elevation at x=0	$B_o := BB_o \cdot \text{ft}^{-1}$	$B_o = 1220.0$
$S_G := 0.0039$	Ground slope		$S_G = 0.00390$
$S_B := S_G$	Aquifer base slope		$S_B = 0.00390$
$QQ_o := -50 \text{ gpm}$	Inflow at x=0	$Q_o := QQ_o \cdot \text{ft}^{-3} \cdot \text{day}$	$Q_o = -9.625 \times 10^3$
$\underline{G}(x) := G_o + S_G \cdot x$	Ground elevation	$G(0) = 1620.0$	$G(L) = 1650.0$
$B(x) := B_o + S_B \cdot x$	Base elevation	$B(0) = 1220.0$	$B(L) = 1250.0$
$\underline{K}(x) := \begin{cases} K_1 & \text{if } x \leq D \\ K_2 & \text{otherwise} \end{cases}$	Hydraulic conductivity distribution along flowpath		

Given $H'(x) = -\frac{\frac{Q_o}{w} + W \cdot x}{K(x) \cdot (H(x) - B(x))}$ $H(0) = H_o$ $\underline{H} := \text{Odesolve}(x, L)$ Governing ODE and BC

"Point-and-shoot" solution method

Iterate on QQ_o and/or WW until the head at $x = LL$ is 1300 ft; that is, $H(L) = 1300$

$H(L) = 1300.1$

This solution is for 1-D horizontal flow and accounts for:

Variable saturated thickness

Uniform downward leakage

Sloping aquifer base

